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I, LEANNE MYNOTT, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PQ 0638 for a patent by HEAD START (QLD) PTY. LTD. filed on 31 May 1999.

WITNESS my hand this
Fourteenth day of June 2000

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HEAD START (QLD) PTY. LTD.
(A.C.N. 010 688 294)

AUSTRALIA
Patents Act 1990

PROVISIONAL SPECIFICATION

Invention Title: OZONE GENERATING APPARATUS

This invention is described in the following statement:

OZONE GENERATING APPARATUS

TECHNICAL FIELD

This invention relates to ozone generating apparatus and has particular relevance to apparatus which operates on corona discharge principles, utilises the phenomenon of air breakdown occurring when electric stress on the surfaces of a conductor exceeds certain values.

BACKGROUND ART

Ozone is used in a wide range of industrial applications such as in the bottling industry to disinfect bottles, in brewing, by the pharmaceutical industry as a disinfectant, in the manufacture of electric components to oxidise surface impurities to breakdown industrial waste like phenol and cyanide so that they become biodegradable, to oxidise mining waste, and for the treatment of harmful compounds such as heavy metals, ethanol and ascetics. It also oxidises phenolics, pesticides, detergents and aromic (smelly) compounds.

It has also been long recognised that polluted indoor air is a health hazard that causes disease, lost work days and in general reduces quality of life. Pollution indoors can often exceed outdoor levels and the transmission of respiratory infections in indoor environments continues to be a substantial health concern.

There are many contaminants which contribute to indoor air pollution and the controlled treatment of living environments with ozone will substantially improve conditions.

Excessive levels of ozone can result in the poisoning of humans or animals and it is therefore necessary to control ozone outputs in relation to an environment being treated.

There are numerous enterprises which specialise in the production of ozone generating apparatus and treatments but to date available apparatus has tended to be technically crude, expensive and inefficient.

It is an object of the present invention to provide an ozone generating apparatus which is efficient compact and one which can be

produced at relatively modest cost and be tailored for specific situations.

Further objects and advantages of the present invention will become apparent from the ensuing description which is given by way of example.

DISCLOSURE OF INVENTION

According to the present invention there is provided an ozone generating device comprising a body having a base portion, an ozone producing region and a vented cover which fully encloses the ozone producing region and which engages the base portion.

According to a further aspect of the present invention in the base portion may be fixed with respect to common rails (as described herein) which allow for variable spacing between elements of the apparatus.

The base portion may house a power source and control means which feeds power to corona discharge means with the ozone producing region and also to a fan interposed between the ozone generating apparatus and the base portion.

The control means may include;

(a) rectification and transformation means,

(b) means to vary currents supplied to corona discharge means,

(c) a controller which enables elements of the apparatus to operate in a predetermined manner,

(d) tamper proofing facilities, and

(e) alarm/fault systems.

The control means can be a current mode PWM controller for DC-DC fixed frequency voltage conversion. The controller may feature closed loop primary current control with a fixed open loop voltage reference.

The controller output is a high voltage low current non-symmetrical high frequency DC pulse.

All electrical componentry associated with power input and the controller may be individually housed.

Free ends of the rails may provide support for the corona

discharge means.

The corona discharge means may comprise a composite of a metallic mesh, an intermediate insulator and a metallic base.

Means may be provided for securing the mesh in relation to the composite.

The corona discharge means operates on similar bases to a spark plug in an internal combustion engine. Sparks are created as a result of a breakdown of insulation between two conductors.

According to a still further aspect of the present invention the ionizing process of the device of the present invention may be created using spark plugs of the type used in internal combustion engines.

Each of their rails may be substantially U-Shaped and resilient to facilitate adjustable "interference" mounting of elements such as a fan housing.

The operation of a fan housed within the apparatus may be supplemented by the provision of an externally mounted co-axial fan.

The vented portion of the body may be adapted as a site for the positioning of support means for articles such as cleaning cloths and rags, brushes including tooth brushes, in fact any article which would benefit from sterilisation.

According to a still further aspect of the present invention a corona discharge unit may comprise a positively charged electrode, a dielectric sleeve which fits onto the positively charged electrode and a negatively charged mesh sleeve mounted on the dielectric sleeve.

The positively charged electrode may be stainless steel rod or bolt.

The negatively charged electrode may be fabricated from stainless steel mesh.

The dielectric sleeve may be formed from a ceramic material.

The corona discharge unit may be mounted in a tube.

An auxiliary fan may be used to induce and dispense air from the tube.

In another embodiment of the present invention the corona discharge unit may be housed within glass tubing.

BRIEF DESCRIPTION OF THE DRAWINGS

Aspects of the present invention will now be described with reference to the accompanying drawings in which;

Figures 1 to 1d are diagrammatic side perspective views of aspects of an ozone generating apparatus in accordance with one possible embodiment of the present invention, and

Figure 2, 2a and 2b illustrate aspects of an electrically powered corona discharge means and apparatus in accordance with aspects of the present invention.

Figure 3 is a perspective view of an ozone generating apparatus in accordance with a further aspect of the present invention, and

Figures 4, 5 and 6 are top, side and exploded views of a further form of corona discharge unit for the ozone generating apparatus of the present invention, and

Figure 7 is a perspective view of a further embodiment of an ozone generator according to the present invention.

With respect to figure 1 of the drawings a device according to the present invention may comprise a body generally indicated by arrow 1 which includes a generally tubular outer casing 1 (shown in figure 1 only). The casing 1a may be provided with vents 2, 3 and may include a carrying handle 4 and attachment means 5. The upper end of the casing may be cylindrical (as illustrated) square or rectangular (not shown).

The outer surface of the casing 1a of the body 1 may mount an auxiliary and coaxial fan (not shown).

Figures 1(a), 1(b), 1(c) and 1(d) of the drawings are side perspective views of the device of the present invention with the casing 1a removed.

The device is provided with a base generally indicated by arrow 7 an ozone producing region indicated by arrow 8.

The ozone producing region 8 and an internal fan 9 may be

fixed to the base 7 by inverted U-shaped rails 10.

The base 7 which may be moulded or fabricated in metal or plastic secures free ends 10a of the rails 10 and receives an electrical power cord 11.

The base 7 can house programmable control means (not shown) within a sealed housing 12.

The free (upper ends) of the rails 10 can provide support for a corona discharge means generally indicated by arrow 13.

In the example illustrated the frame or casing of the fan 9 is a push fit on the rails 10. In the alternative the frame or body of the fan 9 may fit between the rails 10 in such a manner that it can be repositioned without the need for dismantling.

Figures 2 and 2a of the drawings being plan and end views respectively of a corona discharge means 13.

In the example illustrated the corona discharge means comprises a metal plate 15 (which may be a copper plate) an intermediate insulating layer 16, and plastic strips 17 glued to layer 16. Each strip 17 has an overlying portion 18 which entraps a metal mesh plate 19.

A fan forced airflow from the fan 9 (indicated by the path arrow in figure 2) flows over the mesh 19 via open ends 20 of the corona discharge means 14.

The corona discharge means can be supported by the rails 10 via a metal support plate 21. The plate 21 can be provided with aperture 22 of sufficient size to allow a CD module electrical connector wire to pass therethrough, this preventing power being passed through to the body of the device.

Because the mesh plate 19 is subject to the agitation during the corona discharge process, and may be subject to other vibrations it is preferable that it be secured with respect to the backing plate and one way of achieving this is to have a saddle arrangement illustrated by exploded view 2a.

The saddle 23 can have fixtures 24 for fixment to the support 21

and may mount a screw 25 which when the discharge means is assembled is tightened onto the metal mesh 19.

Positive and negative electrical connections 15a and 19a can be made to the plate 15 and mesh 16 respectively. It is noted that the connection 15a is to the geometric centre of the plate 15. The connection 19a to the mesh 19 can be to one side as indicated.

A baffle plate 26 (figure 1(d)) may be positioned on the downstream side of the corona discharge means 14. The function of the baffle 26 being to entrap air at that particular position to encourage secondary separation of oxygen and ozone molecules at that point.

In operation when electric current is of opposite polarity is supplied to the plate 15 and mesh 19 via appropriate electrical connections the phenomenon of corona discharge occurs. Ozone is produced as oxygen atoms are split and an ozone air mixture is force fed from the device by internal fan 9, which as previously mentioned may be assisted by an externally mounted fan unit.

With respect to figures 3 to 6 of the drawings in accordance with a further possible embodiment of the present invention a corona discharge unit generally indicated by arrow 30 may be housed within a tube generally indicated by arrow 31.

The tube 31 may be made of an ozone resistant material and be in many forms and sizes. The function of the tube is to isolate the immediate environment of the corona discharge unit from turbulent air which is induced or blown into the generator casing by the main fan and to furthermore improve delivery of ozone from the corona discharge unit. In other respects the construction of the ozone generator is similar to that previously described. Figures 4, 5 and 6 show an alternative form of corona discharge unit in accordance with the present invention. The discharge unit 30 has positively and negatively charged electrodes 32, 33 interposed by a dielectric element 34.

Positively charged electrode 32 may be in the form of a stainless steel rod or bolt charged via electrical connection 35.

The negatively charged electrode 33 may be in the form of a tubular wound stainless steel mesh charged via an independent electrical connection (not shown).

The dielectrical element 34 may be in the form of a ceramic tube.

Where the positively charged electrode 32 is in the form of a bolt the elements of the discharge unit can be conveniently assembled using a nut 36 and washer 37. A resilient washer 38 can be interposed between washer 37 and the element 34 to lessen the risk of damage to same when assembly nut 36 is tightened.

The corona discharge unit 30 can be centralised in tube 31 by a support 39.

The length of the mesh electrode 33 may be varied to suit.

As mentioned earlier the tube 31 can be of varying sizes and configurations. In figure 5 the tube 31 is elongate and has inlet and outlet nozzles 30, and 41 of reduced size with a view to improving the delivery of ozone from the unit.

An auxiliary fan 42 may be positioned within the tube 31 to further enhance ozone delivery from the tube.

In some instances a glass tube corona discharge unit may be specified.

Such units are commonly available and one such unit where the tube 43 is in a return loop is illustrated by figure 7. Such units can be mounted with respect to the rails 10 by a holder 44.

Apparatus in accordance with the present invention has many advantages including:

(a) the ability to increase commercial profits by extending shelf life of agricultural and horticultural commodities during storage and transit,

(b) improved quality of agricultural and horticultural commodities by inhibiting microbial growth on product surfaces.

(c) lowering the risk of pathogenic agents and cross-contamination in food handling environments,

(d) the improved quality of indoor air by eliminating unpleasant and hazardous odours and reducing risk of respiratory infections and effects of chemical pollutants,

(e) the enhancement of hygiene by accessing and sterilising difficult to clean places, all of which can be achieved with no chemical residue build-up.

Aspects of the present invention have been described by way of example only and it will be appreciated that modifications and additions thereto may be made without departing from the spirit or scope thereof.

DATED this 31st day of May 1999

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By their Patent Attorneys
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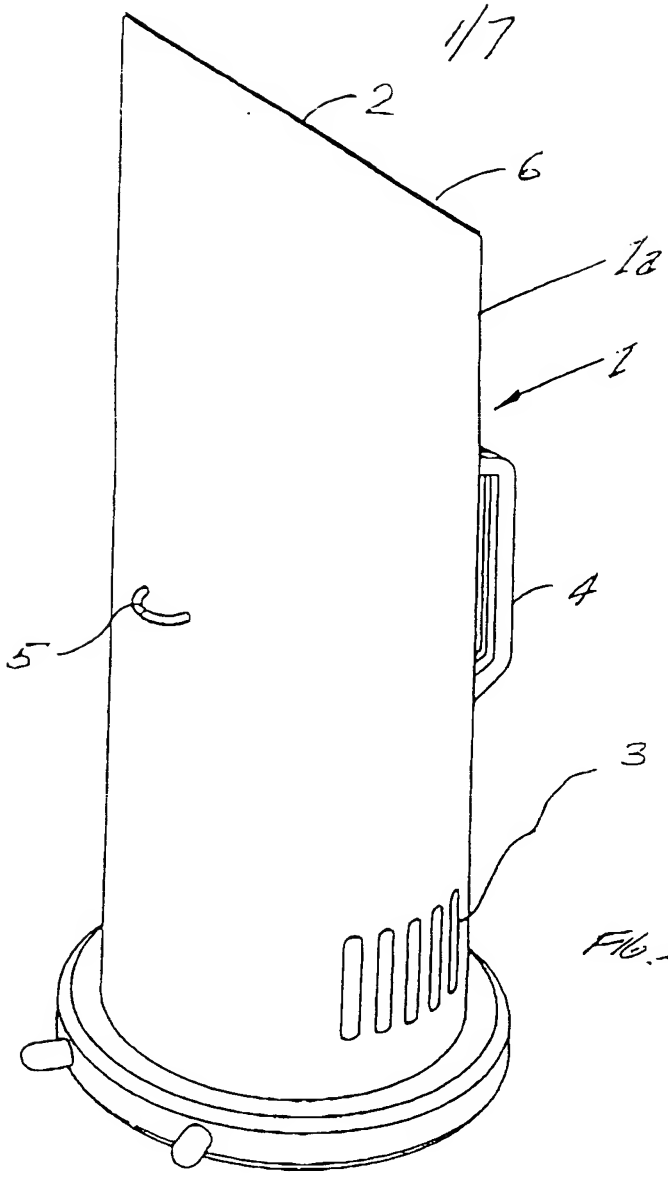

FIG. 1

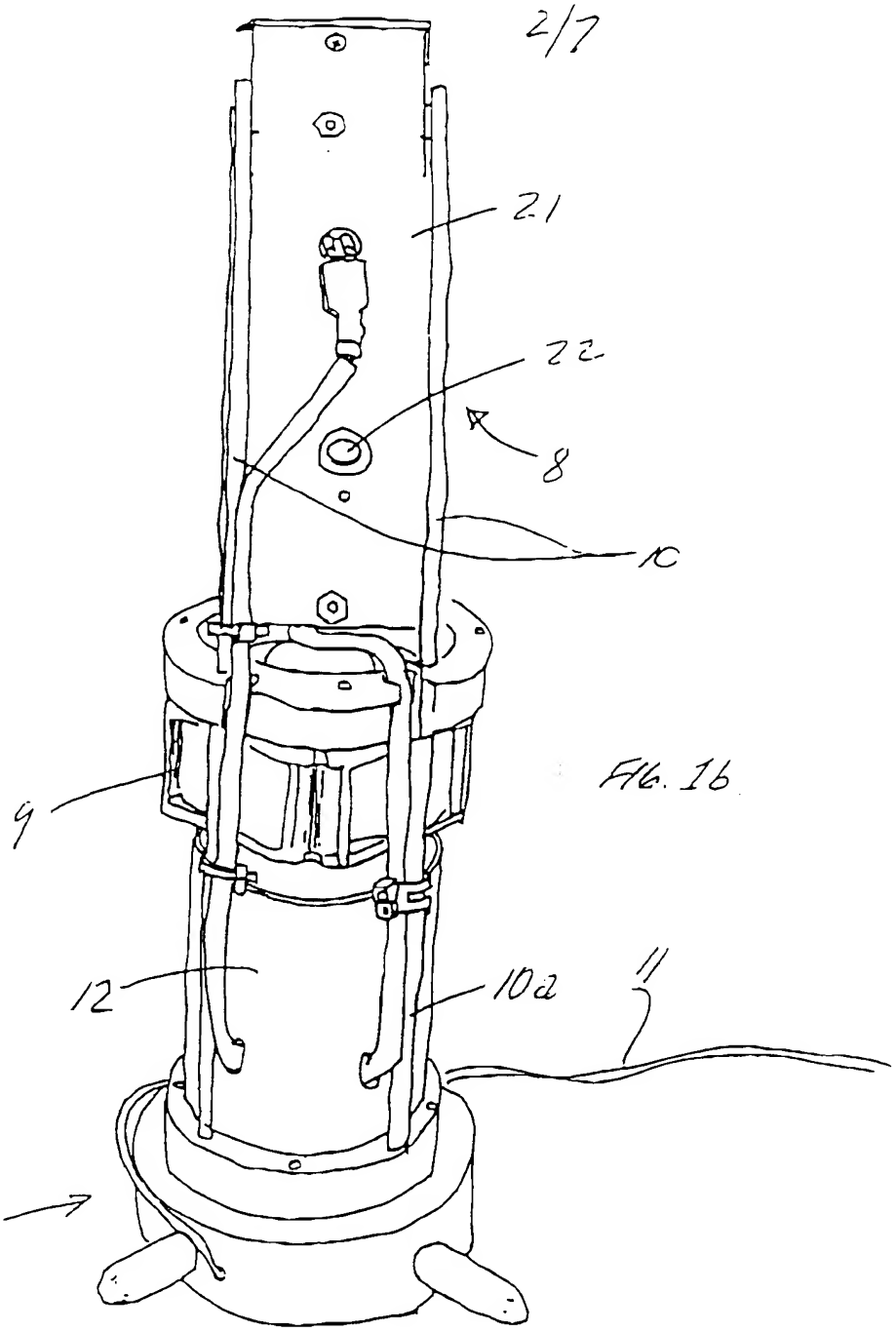

FIG. 16

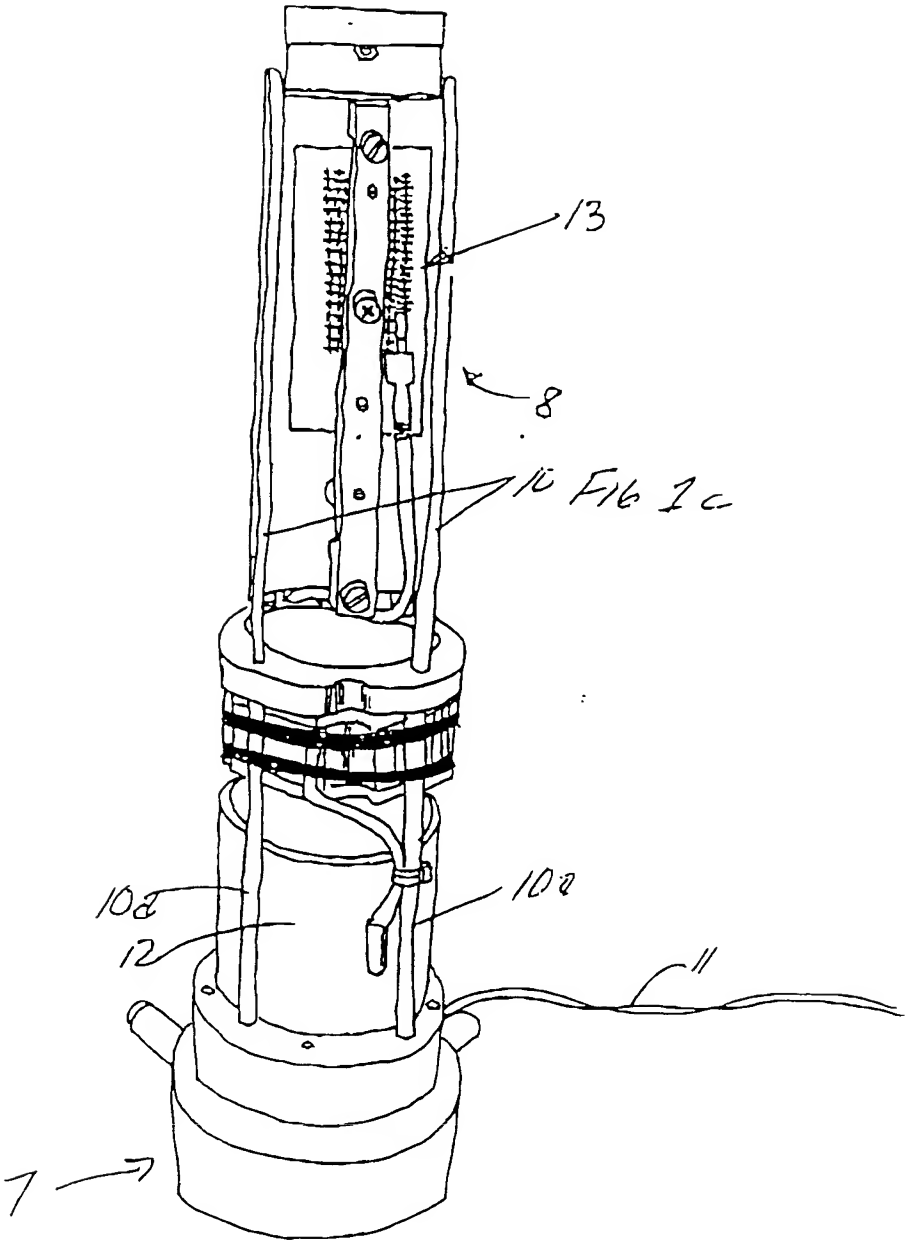

Fig 1c

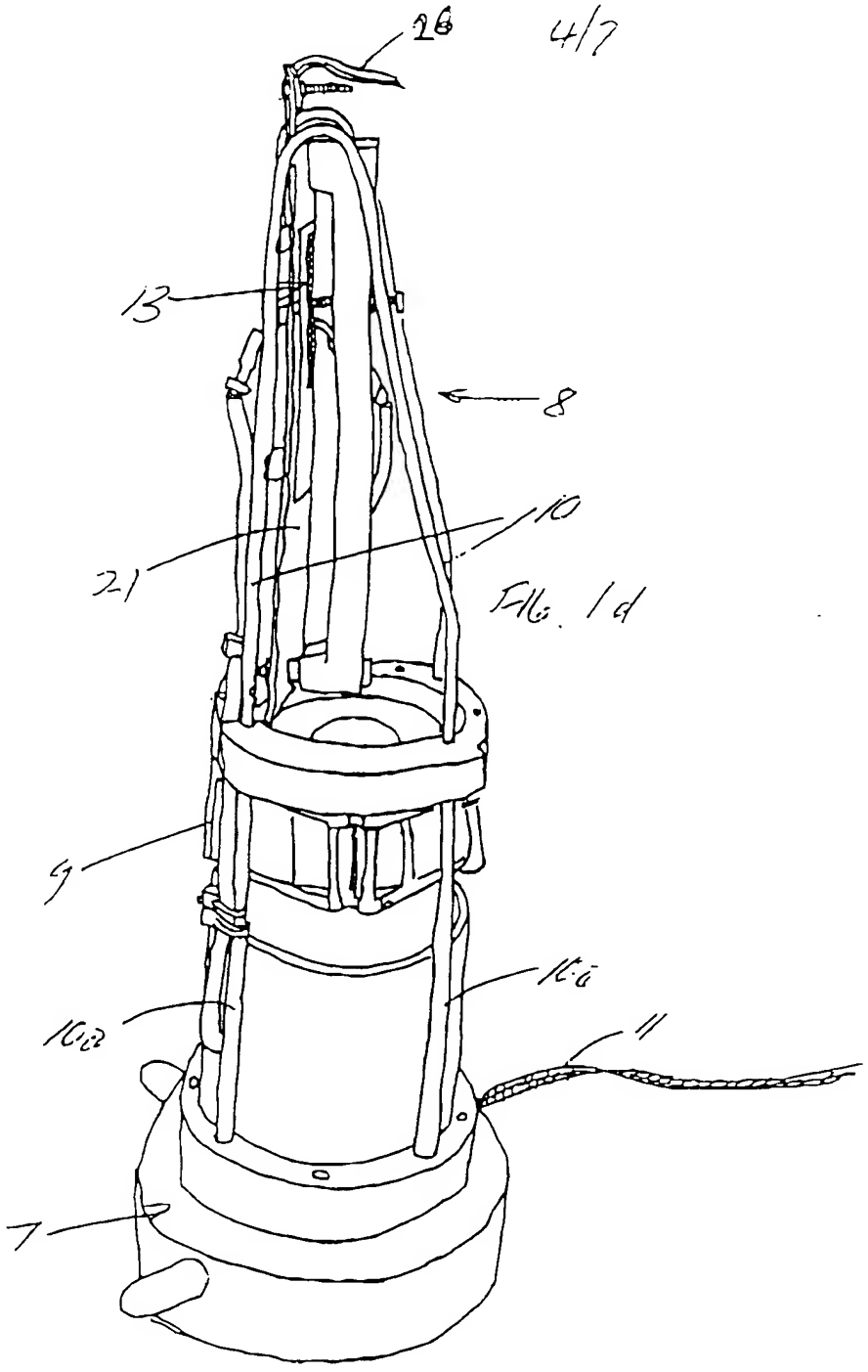

Fig. 1d

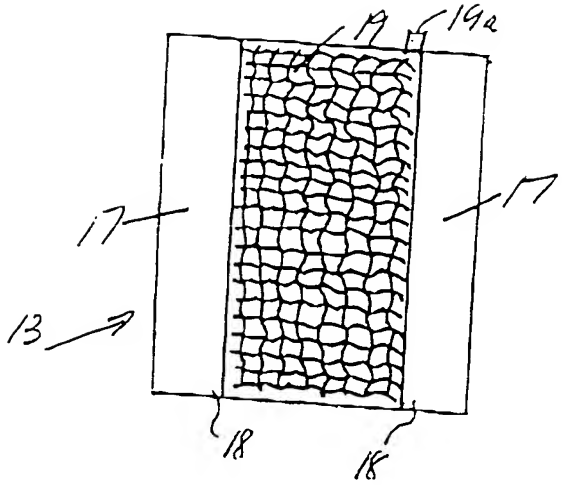

FIG. 2

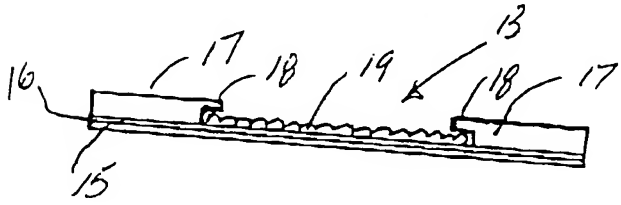

FIG 2a

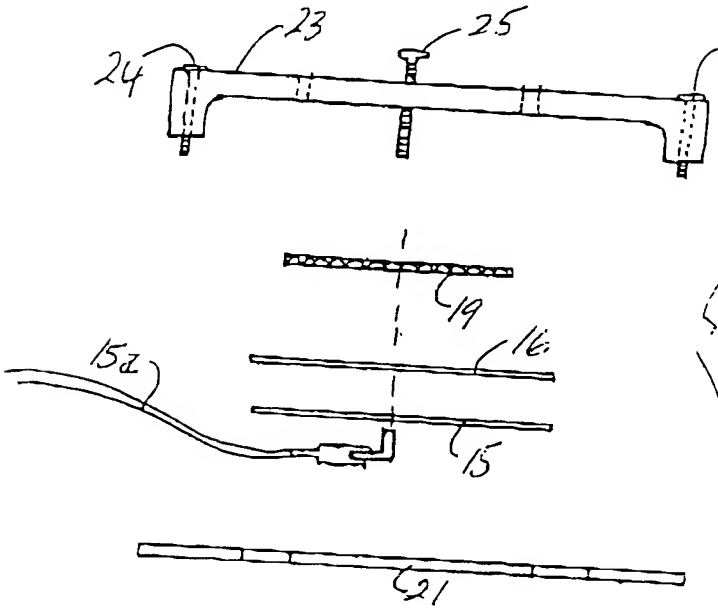

FIG 2b.

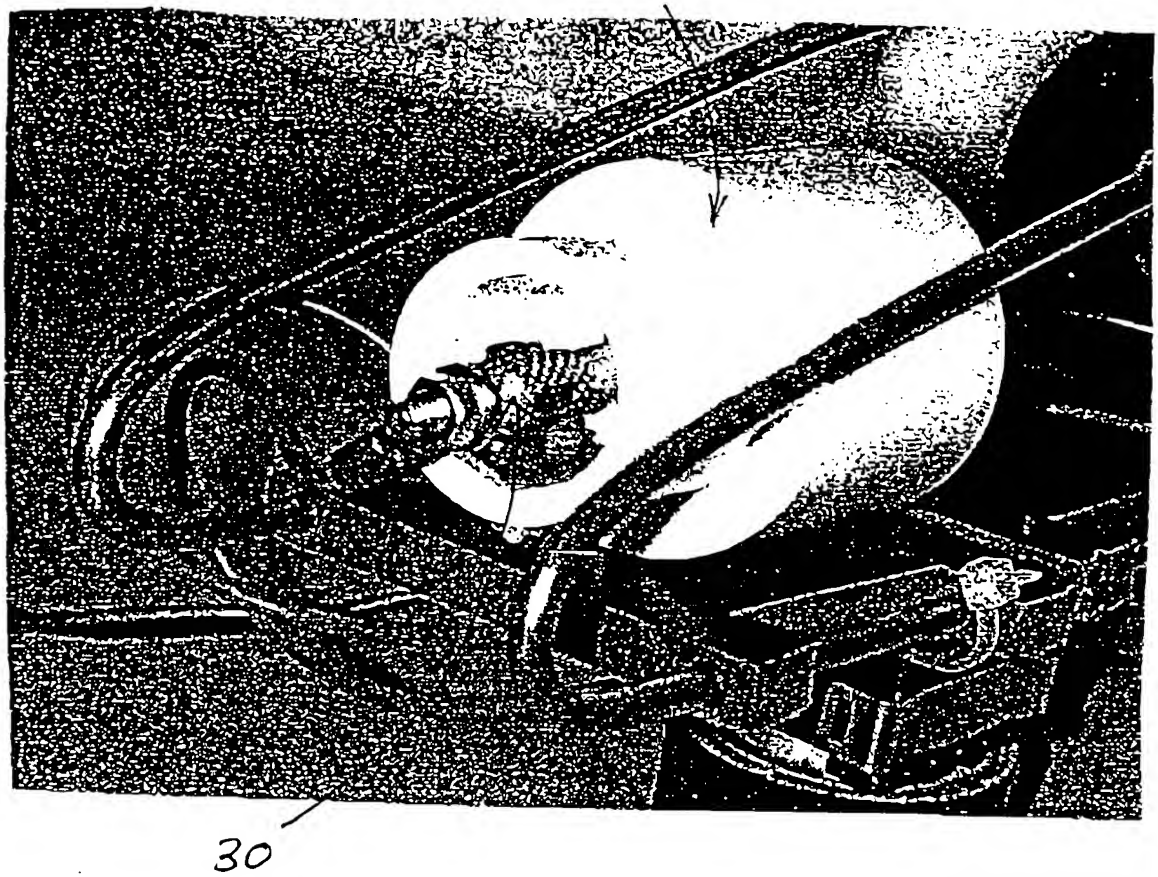

FIG. 3

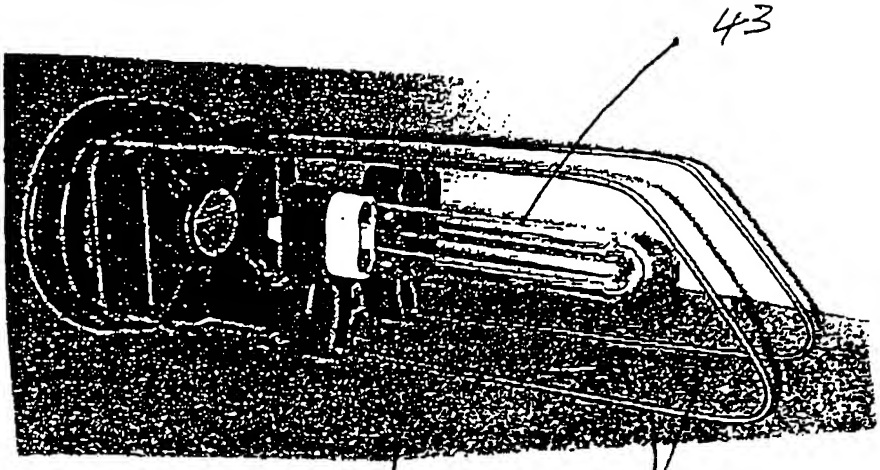

FIG. 7

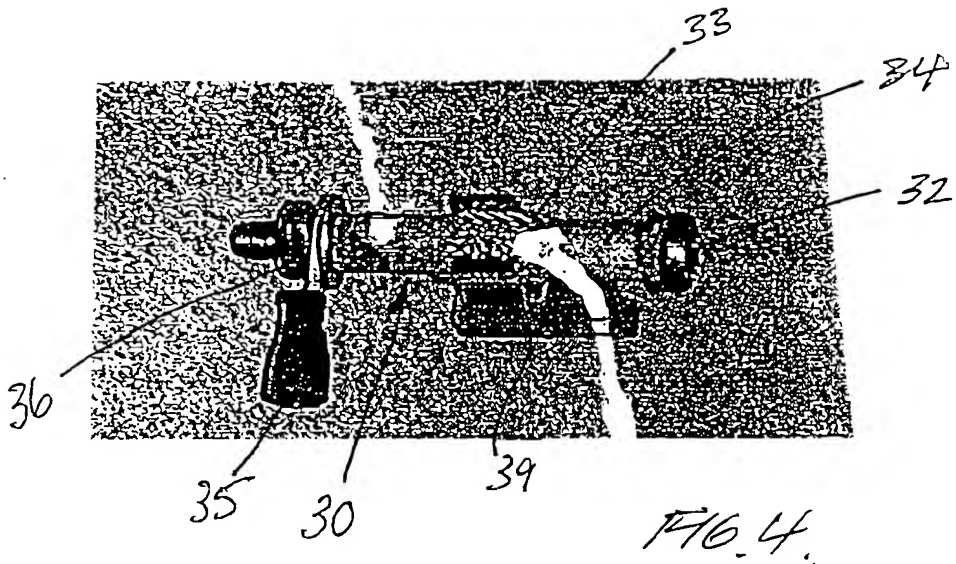

FIG. 4.

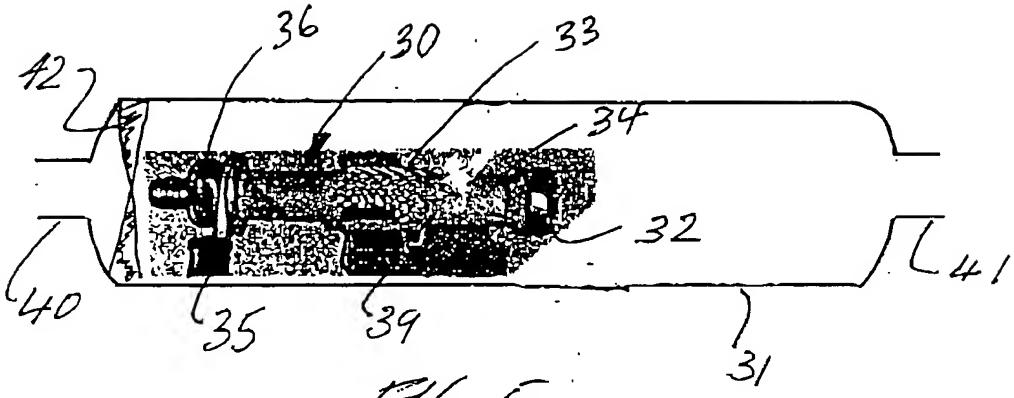

FIG. 5.

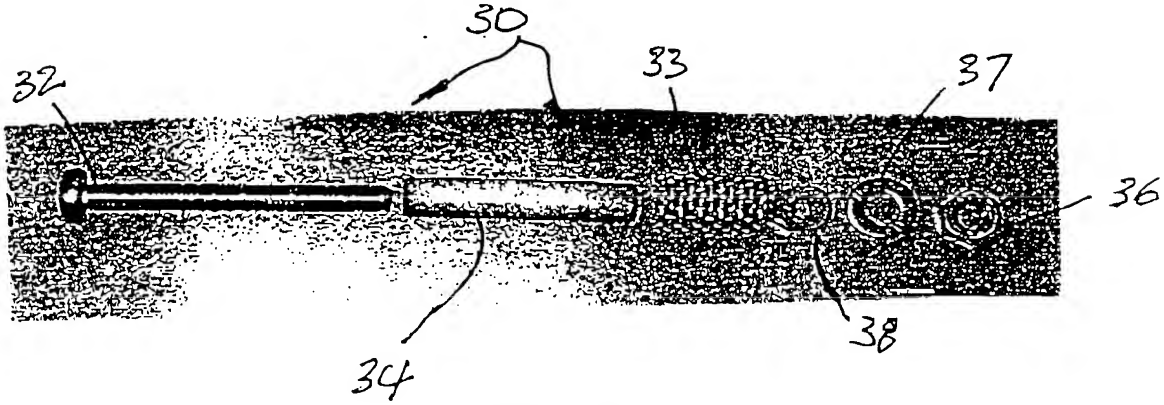

FIG. 6.